10 CFR 50.73

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Palo Verde Nuclear Generating Station

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102-05777-DCM/REB
December 05, 2007

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Unit 2
Docket No. STN 50-529
License No. NPF 51
Licensee Event Report 2007-003-00

Attached, please find Licensee Event Report (LER) 50-529/2007-003-00 which reports a manually initiated reactor trip from approximately 100 percent power due to elevated Steam Generator sodium levels.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the NRC Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Ray E. Buzard, Section Leader, Regulatory Affairs, at (623) 393-5317.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

D. C. Mims

DCM/REB/gat

Attachment
cc: E. E. Collins Jr. NRC Region IV Regional Administrator
M. T. Markley NRC NRR Project Manager - (send electronic and paper)
G. G. Warnick NRC Senior Resident Inspector for PVNGS

IE22
NRR

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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4. TITLE
Manual Reactor Trip due to Increased Steam Generator Sodium Levels from Failed Heat Exchanger Plug

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									None	
10	06	2007	2007	- 003 -	00	12	05	2007	FACILITY NAME None	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
100	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Ray E. Buzard, Section Leader, Regulatory Affairs - Compliance	(623) 393-5317

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	SH	HTEXCH	N010	Y					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On October 6, 2007, at approximately 10:39 MST, Chemistry personnel notified Operations personnel in the Unit 2 control room that main condenser sodium levels were increasing. At approximately 10:59 MST, Chemistry personnel determined and reported that steam generator (SG) sodium levels had increased to above 1 ppm, which is the reactor trip criterion specified by procedure. Unit 2 was manually tripped at 10:59 MST from 100 % power and Operations personnel implemented standard post trip actions. The NRC Resident Inspectors were notified of the reactor trip and the NRC Headquarters was notified via the ENS at 12:32 MST (ENS #43687).

The direct cause of this event was sodium ingress into the Unit 2 condenser hotwell and steam generators due to a corroded and failed tube plug in the “D” condenser air removal (AR) system seal water cooler. The root cause of the event was an error in the tube plug selection process made in January of 2001 resulting from an inadequate assessment of the tube plug material by engineering personnel.

To prevent recurrence, the Unit 2 Condenser AR “D” cooler and tubes were cleaned and the tube plugs were replaced. PVNGS Maintenance Engineering personnel will determine an alternate tube plug type for the condenser AR system seal water coolers which will not be subject to corrosion or galvanic interaction with the titanium tube sheets and tubes. The existing AR system seal water cooler plugs will be replaced with the alternate plug.

One LER has been reported in the past 4 years identifying a manually initiated reactor trip resulting from secondary system contaminant ingress due to a different cause.

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

Note: All times listed in this event report are approximate and Mountain Standard Time (MST) unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This LER (50-529/2007-003-00) is being submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) to report a manual actuation of the reactor protection system (RPS) (EIIS Code: JC) to trip the reactor. Specifically, on October 6, 2007, at approximately 10:59 hours Palo Verde Nuclear Generating Station (PVNGS) Unit 2 control room operators (licensed) manually tripped the reactor from approximately 100% rated thermal power. At 12:32 hours an Event Notification System (ENS) call was made to report the event (ENS #43687).

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

Equipment Description:

The condenser air removal (AR) system (EIIS Code: SH) serves to remove air and non-condensable gases from the main condenser (EIIS Code: SG) to help maintain the vacuum in the main condenser. This vacuum serves to maximize turbine output power and plant efficiency. Four identical condenser air removal units are provided for the main condenser with each unit consisting of the following components:

- Vacuum pump
- Moisture separator
- Seal water recirculation pump
- Seal water cooler

Each unit is cooled by the plant cooling water system. During power operation three condenser air removal units are in service and the fourth is in standby. The standby unit remains available and automatically starts if condenser pressure increases to a preset value, and can be started by the control room operator at any time. As such, the standby air removal cooler is still supplied by the plant cooling water system even while in standby.

The condensate demineralizer system (SC) (EIIS Code: SF) is used to maintain the purity and chemistry of the condensate, feedwater, and steam generator secondary side water. The SC system consists of the following major components:

- six condensate demineralizers
- resin handling and regeneration equipment

The SC system processes secondary plant condensate, when necessary for optimal water chemistry, by directing condensate flow from the discharge of the condensate pumps through an array of polishing demineralizers (ion exchangers). When secondary chemistry

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conditions permit, the system can be left in a standby mode with condensate flow bypassing the demineralizers.

The type of plug used to seal a leaking tube in the AR seal water cooler is a 5/8" Torq N' Seal tube plug composed of BUNA-N rubber and brass metal bolting, nut, and washer.

3. INITIAL PLANT CONDITIONS:

Palo Verde Unit 2 was in Operating Mode 1 (Power Operations), at approximately 100 percent power at the time of this event. Three AR pumps were in operation (A, B, and C), the fourth AR pump (D) was in standby and the condensate demineralizers were in bypass operation. No equipment or components were inoperable at the time of the event that contributed to the event.

4. EVENT DESCRIPTION:

On October 6, 2007, at approximately 10:37 hours, Chemistry personnel responded to local chemistry lab alarm indications of impurity ingress into condenser hotwell 1C, steam generator downcomer feedwater lines, and steam generators 1 and 2. Chemistry personnel notified Operations personnel in the Unit 2 control room that main condenser sodium levels were increasing, and at 10:39 hours, the Control Room received a "Secondary Chemistry Sample Status" trouble alarm. The Control Room Supervisor (CRS) initiated action in accordance with procedure 40AO-9ZZ10, "Condenser Tube Rupture," and placed the condensate demineralizers in service. At approximately 10:59 hours, Chemistry personnel reported that steam generator (SG) sodium levels had increased to greater than 1 ppm, which is the reactor trip criterion specified by 40AO-9ZZ10.

Unit 2 was manually tripped at 10:59 hours from 100 % power and Operations personnel implemented procedure 40EP-9EO01, "Standard Post Trip Actions." The CRS diagnosed an uncomplicated reactor trip. The plant was stabilized in Mode 3 and control room personnel transitioned to procedure 40OP-9ZZ10 "Mode 3 to Mode 5 Operations." The NRC Resident Inspector was notified of the reactor trip, and the NRC Headquarters was notified via the ENS at 12:32 hours (ENS #43687).

5. ASSESSMENT OF SAFETY CONSEQUENCES:

The plant remained within safety limits throughout the event. The primary system and secondary system pressure boundary limits were not approached and no violations of the specified acceptable fuel design limits (SAFDL) occurred. No Engineered Safety Feature (ESF) actuations occurred and none were required. There were no inoperable structures, systems, or components at the time of the event that contributed to this event. The event did not result in any challenges to the fission product barriers or result

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in the release of radioactive materials. Therefore, there were no adverse safety consequences or implications as a result of this event and the event did not adversely affect the safe operation of the plant or health and safety of the public.

The condition would not have prevented the fulfillment of any safety function and did not result in a safety system functional failure as defined by 10 CFR 50.73(a)(2)(v).

6. CAUSE OF THE EVENT:

The direct cause of this event was sodium ingress into the condenser hotwell and Steam Generators due to a corroded and failed tube plug in the "D" AR seal water cooler. As previously described, the condenser air removal units are cooled by plant cooling water (e.g. the source of the sodium), even while in standby.

The event investigation revealed that, in January 2001, this same tube in the "D" seal water cooler had been identified as leaking, and was plugged in both ends with a pair of plugs which had brass bolting material inserted into a hollow rubber plug to expand the rubber plug to seal the tube. On April 26, 2005, that plug pair was replaced with the same kind due to leakage past the old plugs resulting from corrosion. The plugs had not experienced the gross failure described in this event, and as such, the action level for manual trip of the reactor was not reached due to limited ingress of contaminants.

The root cause of the event was an error in the tube plug selection process in January of 2001 in that the assessment of the tube plug material by engineering personnel was inadequate.

7. CORRECTIVE ACTIONS:

The Unit 2 AR "D" cooler and tubes were cleaned and the tube plugs were replaced with a new pair of the same type of plug. As an interim measure, the AR seal water cooler drains were realigned and diverted to the floor drain system rather than to the condenser, so that any future plug failures would not result in elevated sodium ingress to the condenser. This action has been completed for Units 1 and 2, and will be completed for Unit 3 prior to restart from the current refueling outage.

To prevent recurrence, PVNGS Maintenance Engineering personnel will determine an alternate tube plug type for the AR system seal water coolers which will not be subject to corrosion or galvanic interaction with the titanium tube sheets and tubes. This alternate plug will be installed to replace the existing AR system seal water cooler plugs. Until a suitable replacement plug is identified and installed, the affected AR seal water cooler drains will normally be diverted to the floor drain system when the condensate demineralizer polishers are not in full flow or the system is not in a full in-service standby lineup.

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8. PREVIOUS SIMILAR EVENTS:

LER 50-528/2003-002-01 reported a manually initiated reactor trip from approximately 97 percent power due to elevated Steam Generator sodium levels due to a failed tube plug in the main condenser. The failure mechanism for that plug was determined to be a manufacturing defect which was further aggravated during installation of the plug. Because the failure mechanism and type of plug was different, the corrective actions associated with that event would not have prevented this event.